Rotator Cuff, Labrum, & Biceps Injuries

38th Annual
Workers Compensation Seminar
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Shoulder Injuries in Workers Compensation Population

- Department of Labor 2011
  - 3,459 shoulder claims
  - 23%* upper extremity injuries
  - Mean medical $18,111

Shoulder Injuries in Workers Compensation Population

- 29% of all upper extremity claims
- 54 of 10,000 full time equivalents
- Cost $10,776 per claim
- Avg 244 lost work days

Silverstein et. al 8 year data from Washington state 1987-95

Workers Comp Injury Claims Rotator Cuff Injury

- 2nd most common reported specific injury

Significant Cost (Specialist Plug)

WC Rotator cuff repair
Avg cost $52,500
Avg 14 months injury to full return to work

Orthopaedic referral immediate diagnosis
Avg cost $24,900
Avg 7 months injury to full return to work

"Gatekeeper " referral delayed diagnosis & treatment
Avg cost $114,600
Avg 23 months injury to full return to work

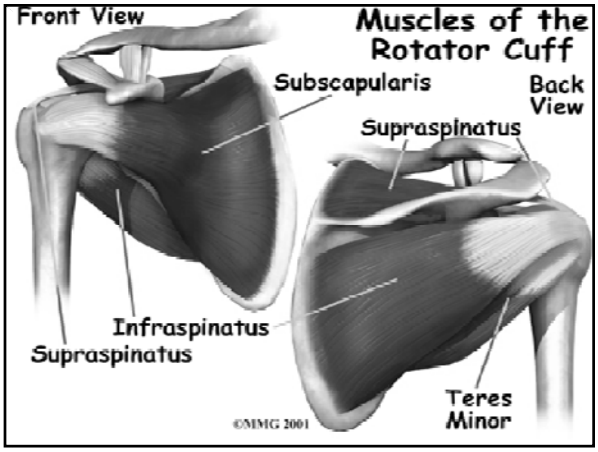
*Savoie et. al. JSES 1996

Clinician Challenge

- Workers Compensation claim is predictor of worse outcome
- Workers comp patients self assessed function/pain worse than matched non-workers comp patients
- Workers comp patients have lower expectations

Brief Outline

- Rotator Cuff Tears
- Labral Tears
- Proximal Biceps Injury



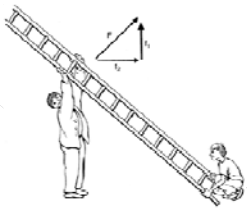
Anatomy & Biomechanics

FANTASTIC 4

- Supraspinatus- initiates humeral abduction
- Infraspinatus- humeral external rotation
- Teres Minor- humeral external rotation
- Subscapularis- humeral internal rotation and humeral head depression

Anatomy & Biomechanics

- Dynamic Stability
  - Compresses humeral head in glenoid to provide a fulcrum for active motion
  - Resists shear of deltoid abduction
  - Mechanical block to dislocation

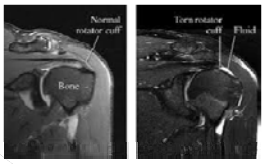


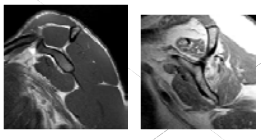
Diagnosis

- Exam
  - Strength Testing
    - Supraspinatus
      - Jobe's test pain and weakness
    - Subscapularis
      - Belly press & lift off
    - Infraspinatus
      - External rotation weakness/lag sign
    - Teres minor
      - Hornblowers

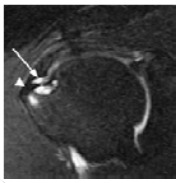
Diagnosis

- Imaging
  - MRI
    - Most useful
      - Tear partial vs. full
      - Atrophy/Fatty Infiltrate
      - Retraction
      - Concomitant pathology
  - Dynamic Ultrasound
    - pacemaker/shoulder replacement
  - CT arthrogram

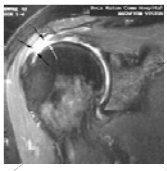




Partial versus Full thickness tears



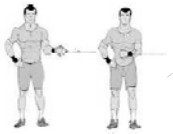
- Partial thickness tear also partially intact
  - Better prognosis
  - Most do not need repair
- Full thickness tear
  - Will progress (enlarge)
  - Muscle atrophy/fatty degeneration
  - Poorer function



Non-operative Management

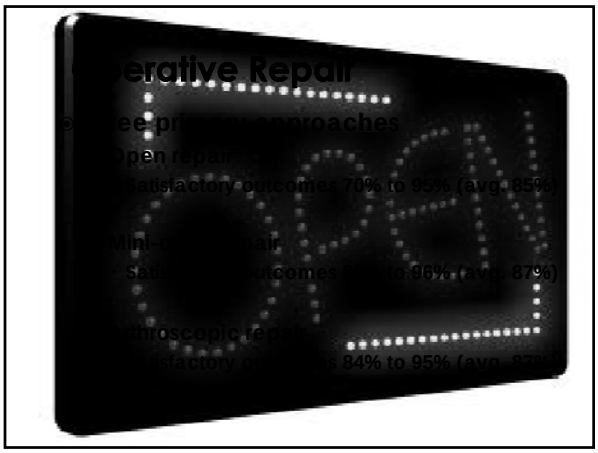
Partial tears

- Physical therapy
  - Phase I- symptom control
  - Phase II- stretch
  - Phase III- strengthen
    - Scapular stabilizers progressing to provocative RTC strengthening
  - Phase IV- return to activity



Operative repair

- Early Operative Intervention Likely Leads to Improved Outcomes
  - Schaefer et al (CORR 2002); Repaired Isolated Supraspinatus Tears → Improvement in Strength Correlated with Muscle Belly Degeneration
  - Harryman et al (JBJS 1991); Functional outcome of repair closely correlated with size of re-tear defect determined by ultrasound. Large tears without re-tear had same outcomes as small tears



Open versus Arthroscopic

- Open repair (Gold Standard)
  - › Stronger fixation
    - Newer studies question
  - › Risk deltoid dehiscense
- Arthroscopic
  - › Evaluate & treat other injuries
  - › Do NOT need to take down deltoid
  - › Less pain???
  - › Faster recovery???
  - › Fixation strength

Complications

- Re-tear/Failure to heal
  - › 20%
  - › Many asymptomatic
- Stiffness
  - › Arthroscpic release and manipulation
- Infection
  - › <1% usually *Proprionibacter acnes*

Post operative rehab

- About as many protocols as surgeons
- My protocol
  - 6 weeks sling with abductor pillow; initiate pendulums after week 2
    - Check every 2 weeks if too still start passive stretching
  - After 6 weeks sling off start stretching and scapular strengthening
  - Initiate RTC strengthening once motion near normal usually week 9-10
- Mounting evidence better healing rates with minimal movement and strain for first 6 weeks

Workers Comp Outcomes

- Multiple studies report poorer outcomes in workers compensation patients
  - Watson & Sonnabend JBJS'02 reported pain worse
  - Henn et.al. JBJS'08 workers comp claim independent variable for worse outcome
    - Secondary variables: secondary gain, psychosocial issues, work demands, comorbidities, smoking

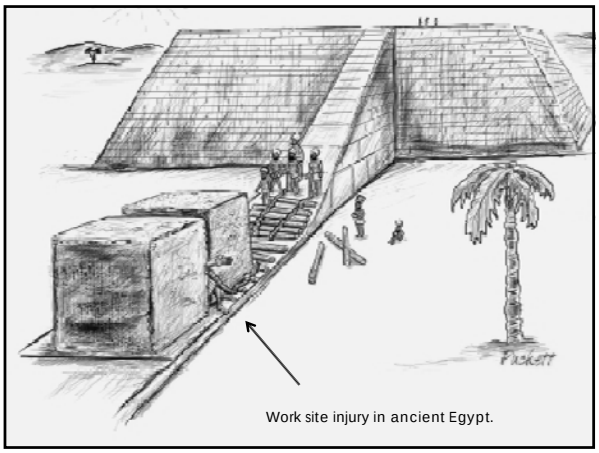
  - Holtby et. al. JSES'10 workers comp do worse but at least they are much better than if not repaired

Workers Comp Outcomes

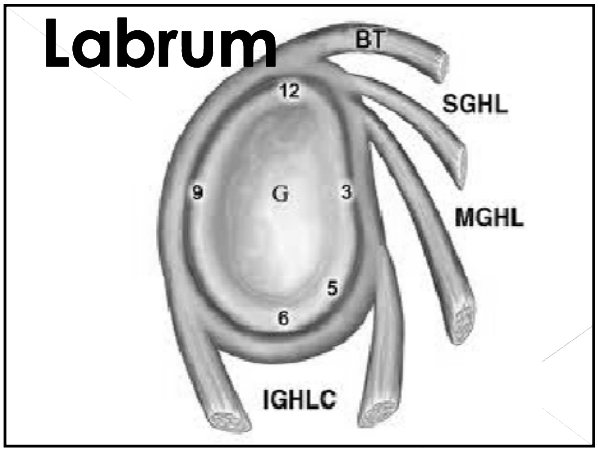
- Cuff & Pupello JSES'12
  - Non-compliance of workers comp patients correlated with worse outcomes
    - WC 52% noncompliance
    - Non-WC 4% noncompliance
  - Within WC population compliant patients had better outcomes

	WC Compliant	WC Non-compliant
ASES score*	73.1	48.4
SST score^	7.9	4.3
Healing rate	75%	59%

*ASES-American Shoulder & Elbow Society, ^SST-Simple Shoulder Test



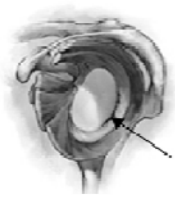
Work site injury in ancient Egypt.



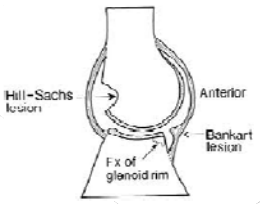
Labral Tears

- Bankart (anterior inferior)
- Posterior
- SLAP (superior labrum anterior posterior)

Bankart tear (anterior inferior labrum)



Bankart Lesion Tear



Laxity vs. Instability

Laxity

Increased glenohumeral excursion without perceived dysfunction

Instability

A pathologic condition secondary to increased joint excursion

Mechanism of Injury

- Forced Abduction/External Rotation

Anatomy and Biomechanics

- Static
  - Glenohumeral congruity
  - Labrum
  - Glenohumeral ligaments
  - Negative pressure
- Dynamic
  - Scapulohumeral rhythm
  - Rotator cuff
  - Joint compression
  - Biceps tendon

Age Matters

- >20
  - 90+% recurrence
- 20-40
  - 35-74% recurrence
- >40
  - 10% recurrence
  - High rate RTC tear

Evaluation

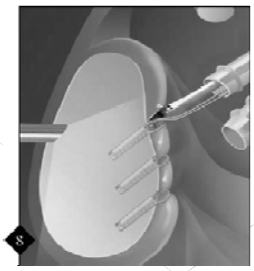
- Exam
  - Neuro status
  - Direction of instability
  - Apprehension
  - Rotator cuff
- Radiologic
  - X-ray-axillary view
  - CT-best for fracture
  - MRI arthrogram

Management

- Non-operative
  - Sling- not shown to prevent recurrence
  - Therapy- strengthen dynamic stabilizers and restore scapulo-thoracic rhythm

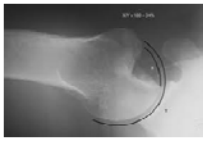
Management

- Operative
  - Bankart repair
    - Open
      - Anatomic repair
      - Subscapularis takedown
        - INCREASED STIFFNESS
    - Arthroscopic
      - Preserve subscapularis
      - Recurrence rates approaching open results

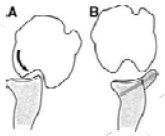


Bone deficiencies

- Hill-Sachs
  - Engaging lesions
  - Defect graft; Remplissage; glenoid grafting



- Glenoid bone loss
  - >20% must address
  - Repair fractures
  - Bone graft- coracoid vs iliac crest



Post-operative rehab

- Similar to rotator cuff
- 6 weeks sling immobilization and pendulums at 2 weeks
- Begin stretching at 6 weeks (avoid passive and manual if possible)
- Strengthening once motion returned; will not release full prior to 5 months

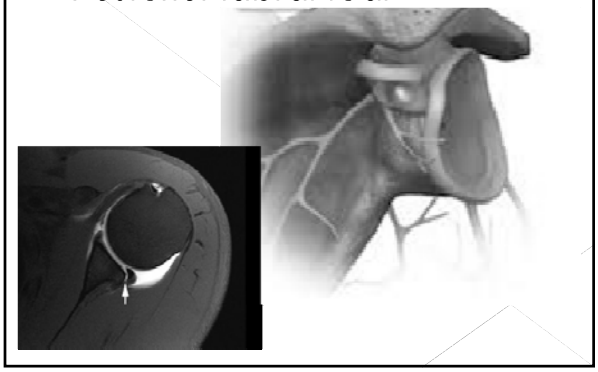
Workers Comp Outcomes

- Hattey et. al. JSES'01
  - Higher rate of recurrence of instability and full functional outcome

Labral Tears

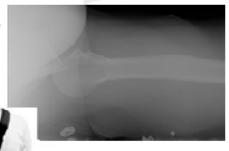
- Bankart (anterior inferior)
- Posterior
- SLAP (superior labrum anterior posterior)

Posterior labral tear



Posterior Instability

- Acute posterior dislocation
  - Electrocution
  - Often missed- extreme lack of external rotation
- Treatment
  - Reduction
  - Gunslinger brace



Recurrent Posterior Instability

- Rarely a discrete injury
  - <25% report injury
- Often due to repetitve microtrauma from axial loads in adducted arm in internal rotation

Soft Tissue/Bone Issues

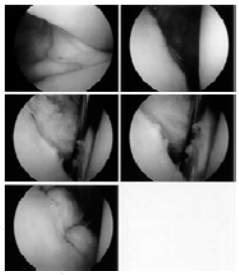
- Posterior labral tear (reverse Bankart)
- Posterior capsule insufficiency
- Rotator interval insufficiency
- Posterior glenoid bone loss
- Reverse Hill-Sachs
- Glenoid/Humeral Retroversion

Management

- Non-operative
  - Sling- not shown to prevent recurrence
  - Therapy- strengthen dynamic stabilizers and restore scapulo-thoracic rhythm

Surgical Repair

- Anatomic labral repair
- Posterior capsular plication
- Rotator interval closure



Rotator Interval- space between subscap & supraspinatus

IGHL

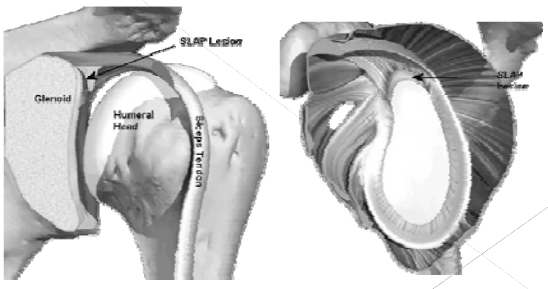
Post-operative Rehab

- Same as Bankart
- 6 weeks sling immobilization (*possible gunslinger*) and pendulums at 2 weeks
- Begin stretching at 6 weeks (avoid passive and manual if possible, *and sometimes internal rotation stretch*)
- Strengthening once motion returned; will not release full prior to 5 months

Labral Tears

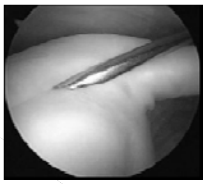
- Bankart (anterior inferior)
- Posterior
- SLAP (superior labrum anterior posterior)

Superior **L**abrum **A**nterior **P**osterior tear



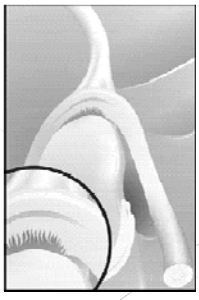
Anatomy

- Biceps attachment to supraglenoid tubercle
  - 5 mm medial to superior rim of glenoid
  - Hyaline cartilage leading to tubercle



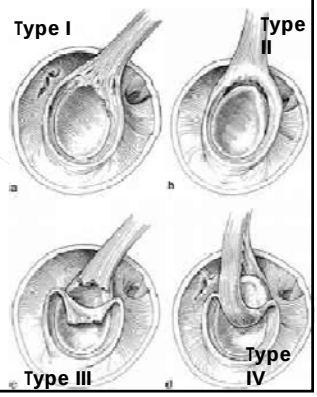
Anatomy

- Many anatomic variants of superior labrum (13 to 25%)
  - Rao (2003), Ilahi (2002)
  - "Buford" complex
    - Williams (1994)
    - Bents (2005) 83% correlation with SLAP tear
  - Sublabral hole
  - Meniscoid labrum
    - Davidson (2004)



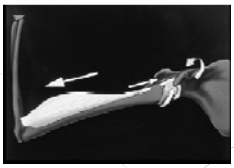
Classification

- Type I
  - 11% Fraying
- Type II
  - 41% Detachment of biceps anchor
- Type III
  - 33% Bucket handle tear w/o extension to biceps
- Type IV
  - 15% Type III with extension into biceps



SLAP Pathophysiology Theories

- Usually a traumatic event
- Compression
  - Fall onto an abducted upper extremity
- Traction
  - Avulsion of superior labrum with traction and biceps contraction
- "Peel-back"
  - Abduction and external rotation: shear force on superior labrum



SLAP Pathophysiology Theories

- Failure of LHB function
  - Subtle shoulder instability leads to biceps overload with failure at the biceps anchor??
  - Repetitive injury to the biceps anchor leads to functional incompetence and secondary capsular overload??

Clinical Assessment Analysis

- Clinical Assessment Meta-analysis, Jones (2007)
  - No one test is superior
  - Original study always had "best" results
  - High variability between independent evaluations of SLAP-specific tests

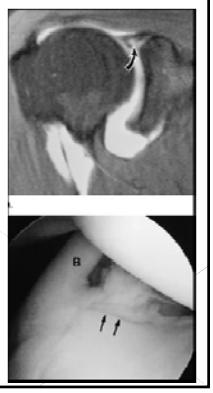
Study	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
O'Brien et al[16]*	100	56.6	64.6	100
Parentis et al[19]	69.5	58	35.5	79.4
McFarland et al[14]	47	55	10	91
Stetson et al[20]	54	31	34	50
Guanche and Jones[2]	63	73	67	49
Myers et al[18]*	77.8	11.1	70	14.3
Nakagawa et al[17]	54	60	52	62

NPV = negative predictive value; PPV = positive predictive value
*Study introducing SLAP-specific test

"Physical exam cannot be used as the sole basis of a diagnosis of a SLAP lesion"

Imaging

- MRI, Bencardino (2000)
- Correlated MRI findings with arthroscopic findings prospectively in 159 patients
- MRI arthrogram:
  - Sensitivity 89%
  - Specificity 91%
  - Accuracy 90%



Management

- Non-operative
  - Sling- not shown to prevent recurrence
  - Therapy- strengthen dynamic stabilizers and restore scapulo-thoracic rhythm

Surgical Management

- Type I debridement
- Type II repair
- Type III debridement
- Type IV repair
- Biceps tenotomy vs tenodesis

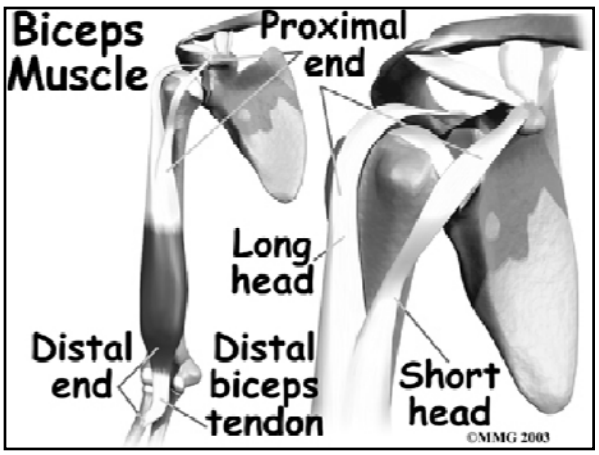
Post-operative Rehab

- Similar to rotator cuff (if cuff repaired concomitantly need to watch for stiffness)
- 6 weeks sling immobilization and pendulums at 2 weeks
- Begin stretching at 6 weeks (avoid passive and manual if possible)
- Strengthening once motion returned; will not release full prior to 5 months

Outcomes

- More of the same
  - Park & Glousman AJSM'11
    - Return to work WC 57.5%/NWC 96.7%
  - Verma et. al. JHSS'07
    - WC 42% return to work at previous level
    - 24% re-operation rate
    - Possible traction mechanism vs repetitive use to blame for result discrepancy when compared to athletes

Versus



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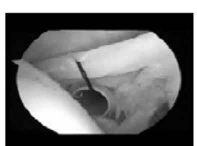
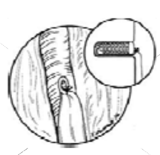
Proximal Biceps Rupture

- Most tolerate very well with no discernible functional loss
  - Usually 10% flexion & 20% supination
- Cosmetic deformity
- Non-operative low demand older
- Biceps tenodesis- younger high demand

Tenodesis



- No consensus on best technique
  - Soft tissue (Pittsburgh)
  - Bicipital groove
  - Sub pec



Conclusions

- Soft tissue shoulder injuries are a significant problem in workers comp population
- Workers compensation patients remain challenging despite improvements in diagnosis and treatment